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First Named Inventor	Mitsuru Hasegawa
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Examiner Name	R. Zervigon
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ENCLOSURES *(Check all that apply)*

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- [ ] Amendment / Reply
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Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm Name	**McGinn Intellectual Property Law Group, PLLC** **8321 Old Courthouse Road, Suite 200, Vienna, VA 22182**		
Signature	Frederick Cooperrider		
Printed name	**Frederick E. Cooperrider, Esq.**		
Date	**February 14, 2008**	Reg. No.	**36,769**

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of: Hasegawa et al.

Serial No.: 10/803,087 Group Art Unit: 1792

Filed: March 18, 2004 Examiner: R. Zervigon

For: SEMICONDUCTOR FILM FORMATION DEVICE

Commissioner of Patents
Alexandria, VA 22313-1450

APPELLANTS' BRIEF ON APPEAL

Sir:

Appellants respectfully appeal the rejection of claims 1, 3-6, 8, 9, 11-14, and 16-20 in the Office Action mailed on December 19, 2007. A Notice of Appeal was timely filed on January 18, 2008.

I. REAL PARTY IN INTEREST

The real party in interest is Hitachi Cable, Ltd., assignee of 100% interest of the above-referenced patent application.

II. RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences known to Appellants, Appellants' legal representative or Assignee which would directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

Claims 1, 3-6, 8, 9, 11-14, and 16-20, all of the claims pending, stand rejected under 35 USC §103(a) as unpatentable over US Patent 5,592,581 to Okase, further in view of US Patent 6,228,174 to Ichiro Takahashi.

Appellants respectfully appeal this rejection for all claims.

IV. STATUS OF AMENDMENTS

In the Office Action mailed on October 19, 2007, the Examiner made final the rejection of record. A Notice of Appeal was filed on January 18, 2008.

V. SUMMARY OF CLAIMED SUBJECT MATTER

<u>Bases in the specification for the claims:</u>

1. (Rejected) A semiconductor film formation device, comprising:

a reaction vessel (102, Fig. 1) that includes a gas flow path to allow a source gas to pass through, a substrate mount site upon which to mount a substrate (104, Fig. 1) being provided in the gas flow path inside the reaction vessel, said substrate mount site being located on an inside surface of said reaction vessel along a first side of said reaction vessel (lines 22-28 of page 5);

a heater (105, Fig. 1) that is disposed along only a single side of said reaction vessel, outside of the reaction vessel on said first side along which the substrate mount site inside the reaction vessel is mounted (lines 2-4 of page 6);

a cooling device (103, Fig. 1; lines 4-6 of page 6) that is disposed along only a single side of said reaction vessel, outside of the reaction vessel on a second side substantially directly opposite to the heater, said cooling device controlling an internal temperature of the reaction vessel in a first section of the gas flow path where the substrate mount site is located; and

a thermal conductivity adjusting member (101, Figs. 1, 2, 3; 107, Figs. 5, 6; 201, Fig. 8; lines 6-8 of page 6) that is disposed between the reaction vessel and the cooling device,

wherein the thermal conductivity adjusting member allows the first section along the gas flow path where the substrate mount site is located to have a thermal conductivity different from that of a second section along the gas flow path, in order to lower a thermal diffusion effect of the source gas in the first section, thereby forming a temperature gradient in the reaction vessel by providing a difference in temperature between regions of the reaction vessel (see Regions 1, 2, 3 in Fig. 1; lines 15-19 of page 6).

6. (Rejected) A semiconductor film formation device, comprising:

a reaction vessel (102, Fig. 7) that includes a gas flow path to allow a source gas to pass through and a substrate mount site on an inside surface of the reaction vessel to mount a substrate in the gas flow path (104, Fig. 1), said substrate mount site being located on a first side of said reaction vessel (lines 22-28 of page 5);

a heater (105, Fig. 7) that is disposed along only one side of the reaction vessel, outside of the reaction vessel on said first side of the reaction vessel as the substrate mount site is located, the heater thereby being close to the substrate mount site (lines 2-4 of page 6); and

a cooling device (103, Fig. 7; lines 4-6 of page 6) to control an internal temperature of the reaction vessel in a section of the gas flow path wherein the substrate mount site is located, the cooling device disposed along only one side of the reaction vessel, outside of the reaction vessel on a second side of said reaction vessel substantially directly opposite to said first side of said reaction vessel that the heater is located,

wherein a wall thickness of the reaction vessel (102, Fig. 7) is smaller in the section along the gas flow path where the substrate mount site is located , thereby forming an interspace (106, Fig. 7) between the reaction vessel and the cooling device to lower a thermal diffusion effect of the source gas in the section of the gas flow at the location of the substrate mount site, thereby forming a temperature gradient in the reaction vessel by

providing a difference in temperature between regions of the reaction vessel (see Regions 1, 2, 3 in Fig. 7; line 25 of page 11 through line 1 of page 12).

9. (Rejected) A semiconductor film formation device, comprising:

a reaction vessel (102, Fig. 1) that includes a gas flow path to allow a source gas to pass through and a substrate mount site provided in the gas flow path to mount a substrate (104, Fig. 1), said substrate mount site being located on an inside surface of said reaction vessel along a first side thereof (lines 22-28 of page 5);

a heater (105, Fig. 1) that is disposed along only a single side of the reaction vessel, outside of the reaction vessel along said first side and close to the substrate mount site (lines 2-4 of page 6);

a cooling device (103, Fig. 1; lines 4-6 of page 6) that is disposed along only a single side of the reaction vessel, outside of the reaction vessel on a second side of said reaction vessel, said second side being substantially directly opposite to the first side of said reaction vessel along which said heater is located, the cooling device controlling an internal temperature of the reaction vessel in a vicinity of the substrate mount site;

a plate member (202, Fig. 8; lines 25-27 of page 12) that is disposed along said second side of said reaction vessel opposite to the substrate mount site in the gas flow path; and

a thermal conductivity adjusting member (201, Fig. 8; lines 6-8 of page 6) that is disposed between the cooling device and the plate member,

wherein the thermal conductivity adjusting member provides a first section along the gas flow path with a thermal conductivity different from a second section along the gas flow path, to lower a thermal diffusion effect of the source gas in the first section, thereby forming a temperature gradient in the reaction vessel by providing a difference in temperature between regions of the reaction vessel (see Regions 1, 2, 3 in Fig. 1; lines 15-19 of page 6).

14. (Rejected) A semiconductor film formation device, comprising:

a reaction vessel (102, Fig. 1) that includes a gas flow path to allow a source gas to pass through and a substrate mount site provided in the gas flow path to mount a substrate (104, Fig. 1), said substrate mount site being located on an inside surface of said reaction vessel on a first side thereof (lines 22-28 of page 5);

a heater (105, Fig. 1) that is disposed along only a single side of said reaction vessel, outside of the reaction vessel along said first side and close to the substrate mount site (lines 2-4 of page 6);

a cooling device (103, Fig. 1; lines 4-6 of page 6) that is disposed along only a single side of said reaction vessel, outside of the reaction vessel on a second side thereof, said second side being substantially directly opposite to the first side along which the heater is disposed, to control an internal temperature of the reaction vessel in a vicinity of the substrate mount site; and

a plate member (202, Fig. 9) that is disposed along said second side, opposite to the substrate mount site in the gas flow path,

wherein the reaction vessel includes a wall thickness (102, Fig. 7) that is smaller in a first section along the gas flow path than a wall thickness in a second section, such as to thereby form an interspace between the reaction vessel and the cooling device to lower a thermal diffusion effect of the source gas in the first section, thereby forming a temperature gradient in the reaction vessel by providing a difference in temperature between regions of the reaction vessel (see Regions 1, 2, 3 in Fig. 1; lines 15-19 of page 6).

VI. GROUND OF REJECTION TO BE REVIEWED ON APPEAL

Appellant presents the single following ground for review by the Board of Patent Appeals and Interferences:

GROUND 1: <u>The Obviousness Rejection for Claims 1, 3-6, 8, 9, 11-14, and 16-20, over US Patent 5,592,581 to Okase, further in view of US Patent 6,228,174 to Ichiro</u>

VII. ARGUMENTS

GROUND 1: <u>The Obviousness Rejection for Claims 1, 3-6, 8, 9, 11-14, and 16-20, over US Patent 5,592,581 to Okase, further in view of US Patent 6,228,174 to Ichiro Takahashi</u>

<u>The Examiner's Position</u>

The Examiner alleges that primary reference Okase satisfies the all claim limitations except the Examiner concedes that Okase fails to teach or suggest:

- using the heater for non-uniform processing;
- having the heater along a single side of the vessel;
- having the cooler along a single side of the vessel; and
- possibly, there is no variable thermal conductivity due to the ceramic wool.

<u>Appellants' Position</u>

Appellants begin by pointing out that there is <u>no</u> element of <u>any</u> independent claim that is reasonably satisfied by primary reference Okase and, indeed, as clearly described in the Abstract, the entire purpose of Okase is to provide a <u>symmetrical</u> structure that provides an even "equal temperature distribution and high repeatability on the entire surface regardless of the diameter thereof." Modification of this reference to place the cooling elements and heating elements respectively along opposite sides of the vessel would clearly defeat this purpose, since one side would clearly be heated asymmetrically.

That is, turning to Figure 7 showing the configuration upon which the Examiner specifically relies, the heating elements 76 and cooling elements 75 are clearly

symmetrically arranged in the periphery of the vessel. Appellants also respectfully submit that one having ordinary skill in the art would not agree with the Examiner that the ceramic wool 72 of Okase reasonably corresponds to the thermal conductivity adjusting member (e.g., 101 of Figure 1 of the present application) of the claimed invention. The Examiner attempts to correlate the thermal conductivity adjusting member of the claimed invention to the ceramic wool in Okase because it would "*... have void spaces resulting in variable thermal conductivity,*"

In response, Appellants respectfully submit that the ceramic wool 72 is even described in lines 53-56 of column 9 of the Okase reference itself as serving the function of "heat insulating members." There is no suggestion that these heat insulating members additionally serve a second purpose to adjust the thermal conductivity, and certainly no suggestion for this function in view of the description of the present invention wherein the heater is on one side of the reaction vessel, the cooling device is on the opposite side of the reaction vessel, and the thermal conductivity adjusting member provides different thermal conductivity along the gas flow path, as described in the language of the independent claims.

The Examiner's attempt to consider that the ceramic wool would have void spaces may or may not be true, but the Examiner fails to provide any documentation supporting his position that one having ordinary skill in the art would consider such void spaces as providing an adjustment in the thermal conductivity along the gas flow path.

Thus, absent additional evidence not currently of record, Appellants submit that the ceramic wool (e.g., heat insulating members) 72 used in Okase cannot reasonably be considered as satisfying the plain meaning of the language of the independent claims requiring a thermal conductivity adjusting members. The only possible thermal conductivity adjustment reasonably resultant from the ceramic wool in Okase would be due to its insulation effect, which would be perpendicular to the gas flow path rather than along the gas flow path, as required by the language of the independent claims.

Moreover, Appellants respectfully submit that the substrate mount site in primary reference Okase is clearly in the center of the reaction vessel, not along the side having the heater, as required by the independent claims.

Therefore, since the Examiner concedes that primary reference Okase fails to have the heater and cooling elements along respective opposite sides of the reaction vessel, Appellants respectfully submit that primary reference Okase clearly fails to demonstrate even one claim limitation of the independent claims. Accordingly, it is clear that modification of Okase to conform to the limitations would improperly change the principle of operation of Okase, which is not permitted by the holding in *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959), as described in MPEP §2143.01: "*If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious.*"

Moreover, modifying the configuration of Okase to place the heater along one side and the cooling device along the opposite side would clearly cause a temperature gradient within the vessel that would no longer satisfy the purpose described in the Abstract of Okase that there be an equal temperature distribution across the surface regardless of the diameter. Thereby, since the modification would clearly defeat a declared purpose of Okase, it would also be improper under the holding of *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984), as also described in MPEP §2143: "*If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification.*"

Therefore, based upon the rationales in *Ratti* and *Gordon*, Appellants submit that it would be improper to even modify primary reference Okase to conform the description in even the independent claims, so that the rejection currently of record fails to meet the initial burden of a *prima facie* rejection.

Moreover, Appellants respectfully submit that secondary reference Takahashi would not reasonably be considered by one having ordinary skill in the art to overcome these deficiencies of primary reference Okase. Takahashi does not demonstrate an appropriate thermal conductivity adjusting member and does not demonstrate a heating element and cooling element on respectively opposite sides or the substrate mount site on one side near the heating element. The Examiner points to heating element 4 in Figure 1 of Takahashi, along with the description in the Abstract.

However, Appellants respectfully submit that one having ordinary skill in the art would not agree with the Examiner that any of the missing elements, let alone all of the missing elements, are demonstrated in Takahashi, so that, even if Okase were to be modified by this secondary reference, the combination would still fail to provide the result described in even the independent claims.

Of particular interest is that newly-cited Takahashi is described in line 50 of column 6 through line 8 of column 7 as using a PID temperature control unit for achieving a desired temperature distribution. The term "PID" means "Proportional-Integral-Derivative" algorithm, which refers to a type of feedback controller. As described in Takahashi, "a number of thermocouple temperature sensors may be arranged in various places of the heating chamber and the auxiliary heating chambers so that the heater elements may be individually controlled and desired temperature over the entire heating chambers." Namely, the temperature is controlled by controlling power of the heaters in accordance with the temperatures actually measured at various points in the chambers.

In contrast, in the present invention, the temperature gradient is achieved by its structural arrangement comprising a thermal conductivity adjusting member. Therefore, the technical idea of Takahashi is completely different from that of the present invention.

The present invention is characterized by that a temperature gradient is formed in the reaction vessel by providing a difference in temperature between regions of the reaction vessel. Namely, a temperature distribution in the reaction vessel is controlled to be non-uniform.

According to this structure, a semiconductor film having uniform thickness and composition ratio can be obtained. This effect was first discovered by the present inventors.

In contrast, primary reference Okase discloses a heat treatment apparatus in which a workpiece is heated with an equal temperature distribution and high repeatability on its entire surface. The object of Okasa is to provide a heat treatment apparatus for heat treating the workpiece with an equal temperature distribution. Another object of Okase is to provide a heat treatment apparatus for causing the temperature distribution and the concentration of a process gas to be equal on the entire surface.

Accordingly, Okase fails to disclose or to suggest that the temperature distribution is controlled to be non-uniform. Okase rather discloses a technical idea completely opposite to that of the present invention. Therefore, Okase teaches away from that the temperature gradient is formed in the reaction vessel.

For the reasons stated above, the claimed invention is fully patentable over the reference, and the Board is respectfully requested to reconsider and withdraw this rejection.

IX. CONCLUSION

In view of the foregoing, Appellants submit that claims 1, 3-6, 8, 9, 11-14, and 16-20, all the claims presently pending in the application, are clearly enabled and patentably distinct from the prior art of record and in condition for allowance. Thus, the Board is respectfully requested to reverse the rejection of claims 1, 3-6, 8, 9, 11-14, and 16-20.

Please charge any deficiencies and/or credit any overpayments necessary to enter this paper to Attorney's Deposit Account number 50-0481.

Respectfully submitted,

Dated: 02/14/08

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CLAIMS APPENDIX

The claims, as reflected upon entry of the Amendment Under 37 CFR §1.111 filed on August 8, 2007, are shown below:

1. (Rejected) A semiconductor film formation device, comprising:

a reaction vessel that includes a gas flow path to allow a source gas to pass through, a substrate mount site upon which to mount a substrate being provided in the gas flow path inside the reaction vessel, said substrate mount site being located on an inside surface of said reaction vessel along a first side of said reaction vessel;

a heater that is disposed along only a single side of said reaction vessel, outside of the reaction vessel on said first side along which the substrate mount site inside the reaction vessel is mounted;

a cooling device that is disposed along only a single side of said reaction vessel, outside of the reaction vessel on a second side substantially directly opposite to the heater, said cooling device controlling an internal temperature of the reaction vessel in a first section of the gas flow path where the substrate mount site is located; and

a thermal conductivity adjusting member that is disposed between the reaction vessel and the cooling device,

wherein the thermal conductivity adjusting member allows the first section along the gas flow path where the substrate mount site is located to have a thermal conductivity different from that of a second section along the gas flow path, in order to lower a thermal diffusion effect of the source gas in the first section, thereby forming a temperature

gradient in the reaction vessel by providing a difference in temperature between regions of the reaction vessel.

2. (Canceled)

3. (Rejected) The semiconductor film formation device according to claim 1, wherein:

the first section comprises an interspace formed between the reaction vessel and the thermal conductivity adjusting member.

4. (Rejected) The semiconductor film formation device according to claim 3, wherein:

the interspace has a varying height along the gas flow path.

5. (Rejected) The semiconductor film formation device according to claim 1, wherein:

the first section comprises a material having a thermal conductivity that is different from a thermal conductivity of a material of the second section.

6. (Rejected) A semiconductor film formation device, comprising:

a reaction vessel that includes a gas flow path to allow a source gas to pass through and a substrate mount site on an inside surface of the reaction vessel to mount a substrate in the gas flow path, said substrate mount site being located on a first side of said reaction vessel;

a heater that is disposed along only one side of the reaction vessel, outside of the reaction vessel on said first side of the reaction vessel as the substrate mount site is located, the heater thereby being close to the substrate mount site; and

a cooling device to control an internal temperature of the reaction vessel in a section of the gas flow path wherein the substrate mount site is located, the cooling device disposed along only one side of the reaction vessel, outside of the reaction vessel on a second side of said reaction vessel substantially directly opposite to said first side of said reaction vessel that the heater is located,

wherein a wall thickness of the reaction vessel is smaller in the section along the gas flow path where the substrate mount site is located, thereby forming an interspace between the reaction vessel and the cooling device to lower a thermal diffusion effect of the source gas in the section of the gas flow at the location of the substrate mount site, thereby forming a temperature gradient in the reaction vessel by providing a difference in temperature between regions of the reaction vessel.

7. (Canceled)

8. (Rejected) The semiconductor film formation device according to claim 6, wherein:

the interspace has a height that varies along the gas flow path.

9. (Rejected) A semiconductor film formation device, comprising:

a reaction vessel that includes a gas flow path to allow a source gas to pass through and a substrate mount site provided in the gas flow path to mount a substrate, said substrate mount site being located on an inside surface of said reaction vessel along a first side thereof;

a heater that is disposed along only a single side of the reaction vessel, outside of the reaction vessel along said first side and close to the substrate mount site;

a cooling device that is disposed along only a single side of the reaction vessel, outside of the reaction vessel on a second side of said reaction vessel, said second side being substantially directly opposite to the first side of said reaction vessel along which said heater is located, the cooling device controlling an internal temperature of the reaction vessel in a vicinity of the substrate mount site;

a plate member that is disposed along said second side of said reaction vessel opposite to the substrate mount site in the gas flow path; and

a thermal conductivity adjusting member that is disposed between the cooling device and the plate member,

wherein the thermal conductivity adjusting member provides a first section along the gas flow path with a thermal conductivity different from a second section along the gas flow path, to lower a thermal diffusion effect of the source gas in the first section, thereby forming a temperature gradient in the reaction vessel by providing a difference in temperature between regions of the reaction vessel.

10. (Canceled)

11. (Rejected) The semiconductor film formation device according to claim 9 wherein:

the first section comprises an interspace formed between the reaction vessel and the thermal conductivity adjusting member.

12. (Rejected) The semiconductor film formation device according to claim 11, wherein:

the interspace has a height that varies along the gas flow path.

13. (Rejected) The semiconductor film formation device according to claim 11, wherein:

the first section comprises a material whose thermal conductivity is different from that of a the second section.

14. (Rejected) A semiconductor film formation device, comprising:

a reaction vessel that includes a gas flow path to allow a source gas to pass through and a substrate mount site provided in the gas flow path to mount a substrate, said substrate mount site being located on an inside surface of said reaction vessel on a first side thereof;

a heater that is disposed along only a single side of said reaction vessel, outside of the reaction vessel along said first side and close to the substrate mount site;

a cooling device that is disposed along only a single side of said reaction vessel, outside of the reaction vessel on a second side thereof, said second side being substantially directly opposite to the first side along which the heater is disposed, to control an internal temperature of the reaction vessel in a vicinity of the substrate mount site; and

a plate member that is disposed along said second side, opposite to the substrate mount site in the gas flow path,

wherein the reaction vessel includes a wall thickness that is smaller in a first section along the gas flow path than a wall thickness in a second section, such as to thereby form an interspace between the reaction vessel and the cooling device to lower a thermal diffusion effect of the source gas in the first section, thereby forming a temperature gradient in the reaction vessel by providing a difference in temperature between regions of the reaction vessel.

15. (Canceled)

16. (Rejected) The semiconductor film formation device according to claim 14, wherein:

the interspace has a varying height along the gas flow path.

17. (Rejected) The semiconductor film formation device according to claim 1, wherein said gas flow path is substantially parallel with an exposed upper surface of said substrate as mounted upon said substrate mount site.

18. (Rejected) The semiconductor film formation device according to claim 6, wherein said gas flow path is substantially parallel with an exposed upper surface of said substrate as mounted upon said substrate mount site.

19. (Rejected) The semiconductor film formation device according to claim 9, wherein said gas flow path is substantially parallel with an exposed upper surface of said substrate as mounted upon said substrate mount site.

20. (Rejected) The semiconductor film formation device according to claim 14, wherein said gas flow path is substantially parallel with an exposed upper surface of said substrate as mounted upon said substrate mount site.

EVIDENCE APPENDIX

None

RELATED PROCEEDINGS APPENDIX

None